# The trickle down effects of parental retirement on adult children well-being: evidence from the UK

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PRELIMINARY DRAFT- DO NOT DISSEMINATE

**Abstract**

This paper explores the causal effect of parental retirement on adult children's well-being, an area primarily overlooked in current literature. As societies age and retirement rates increase, policymakers concerned with the financial sustainability of pension systems must comprehend these ripple effects. We establish a causal relationship between parental retirement and adult-child well-being and provide evidence for mechanisms that pertain to inter-generational time and financial transfers. We employ two identification strategies: a Fuzzy Regression Discontinuity Design based on the eligibility age for the State Pension and a Differences-in-Difference design based on the provisions of the UK 1995 and UK 2011 Pension Acts. We draw data from the British Household Panel Survey and Understanding Society to follow parents and children up to and after retirement. The findings offer fresh evidence on the societal consequences of policies targeting retirement age.

**Key words**: Retirement; Well-being; Adult children; Inter-generational transfers

**JEL classification**: J08; J26; I31; H23

# 1 Introduction

The aging of the population is a challenge many OECD countries face. The United Kingdom is not an exception. With life expectancy increasing, UK-based projections indicate that by 2043, 24% of the population will be aged 65 and over, challenging the financial sustainability of the pension system (see Lewis et al., 2021). Across OECD countries, the most popular policy response has been increasing the minimum age at which people may start claiming their state pension. The relationship between adult children and their elderly parents becomes critical in this context, as the well-being and security of both generations depend on whether and how retirement affects the dynamics of mutual exchanges. In this paper we answer the following question: do parental retirement causally impact adult children well-being?

The proposed mechanisms stem from the literature on informal mutual exchanges between adult children and their elderly parents. Specifically, time and financial investments - it is clear that both kinds of transfers vary across the life course and may play a decisive role when the latter retires (see Cox, 1987, Coe and Zamarro, 2011). Firstly, as people age, they are more likely to experience health problems, disability, and declining economic resources, making it more challenging to maintain their standard of living. Moreover, recent literature highlights the boosting role of retirement in this physical and economic decline (see Gorry et al., 2018, Cribb et al., 2016). In this context, the support of adult children in the form of financial transfers and informal care is likely to occur (Van Houtven et al., 2013, Van den Berg et al., 2014).

Secondly, grand-parenting activities are essential to the UK's inter-generational time and financial exchanges. According to a study by the Office for National Statistics, approximately 40% of grandparents over the age of 50 in the UK provide regular childcare for their grandchildren, saving working parents around £7 billion nationally in childcare costs (Buchanan and Rotkirch, 2018), with the majority of this care offered by grandmothers. This support can range from occasional babysitting to more formal arrangements, such as regularly caring for the grandchildren. Overall, these stylized facts highlight the

significance of inter-generational exchanges in the UK.

We rely on a fuzzy regression discontinuity design and a difference-in-differences design (DID) to answer our research question. We draw upon two representative household panels from the United Kingdom (British Household Panel and Understanding Society) to link life course information on older parents and their adult children at the time of parental retirement. In the first identification strategy, we use discontinuous increases in the probability of retiring at the State Pension Age to identify the causal effect of the parent's retirement on their well-being and their adult children's well-being outcomes. In the second identification strategy, we leverage two recently implemented UK Pension Acts and estimate through difference-in-differences (DiD) the effect of an unexpected increase in State Pension Age on the well-being of the generation of the offspring.

The RDD's IV estimates suggest that retirement directly and positively impacts retirees' leisure satisfaction and mental health. Only for mothers, retirement positively affects also subjective health, while it deteriorates the subjective financial situation for both mothers and fathers. On the second generation (i.e., adult children), we find a positive and significant (p-value <0.1) impact of mothers' retirement on adult children's life satisfaction and income satisfaction—the coefficient for income satisfaction driven by adult sons. At the same time, we found a positive and significant effect on adult daughters' mental health. Father retirement has a not significant impact on adult children's well-being.

We explore the heterogeneity in the result in several ways. Focusing on mother retirement, we look at effect size differences among adult children with and without children at the time of maternal retirement. Then we further stratified the adult children with children sample according to grandchildren's age. Here we found that the effect on life satisfaction and income satisfaction is positive only for adult children with children in the 5-11 age range. The stratification by income levels shows that mother retirement positively affects the life satisfaction of adult children in the lowest income band (i.e., in the first income quartile). Finally, looking at differentials by mother-child geographical distance, we found, as expected, that the positive effect is driven by adult children living

nearby their parents in the years before maternal retirement.

Turning to the second identification strategy, we found that the legislated increase in State pension ages has effectively increased the labor market attachment of parents. We found a positive effect of the reform on parents' working hours compared to their untreated counterparts. Simultaneously, treated parents report a lower level of leisure satisfaction but a higher level of financial satisfaction. The first stage results reinforce our RDD findings, but we found no significant differences in well-being among treated and untreated mothers at the adult children level. However, contrary to what we found in the first identification strategy, the DiD estimates reveal significant positive effects of treated fathers on adult children's life satisfaction and income satisfaction, driven by sons. Heterogeneity analysis based on adult children's income levels shows that adult children in the first quartile of the income distribution drive this effect. The effect is nearly zero for adult children in the higher-income quartile.

The remainder of this article is organized as follows. Section 2 described the institutional setting and outlined the proposed theoretical mechanisms. Section 3 presents the data and the key variables of interest. Section 4 outlines the methodological process. Section 5 elaborates on the findings. Section 6 presents the concluding discussion.

# 2 Institutional setting

### *2.1 Uk Pensions systems and Pension reforms*

Until 1995, the state pension system in the UK was a two-tier system consisting of a basic state pension and an earnings-related state pension.[1] Over time, the face of an aging population and increasing life expectancy have raised concerns about the system's sustainability. As a result, the UK government implemented major reforms to the pension system in 1995, which included the introduction of a single-tier flat-rate state pension.

The central point of this first intervention was the phasing in equalizing state pension

[1] The basic state pension provided a basic level of income for all retirees, while the earnings-related state pension, known as the State Second Pension (SERPS), aimed to provide additional income for those with moderate to high earnings.

ages among men and women over ten years. The 2011 Pensions Act introduced timetables for increasing women's State Pension age to 65 and increasing men's and women's State Pension age to 66. The State Pension age for women born after March 1950 has risen gradually since April 2010 and reached 65 in November 2018. After 2018, the State Pension age for both men and women born after December 1953 has risen, reaching 66 by 2020, with further rises legislated to 67 by 2028 and 68 by 2046.

In addition to State Pensions, many UK workers have occupational and private pension funds, which provide additional income after retirement. The State Pension remains a significant source of income for many retirees, particularly for those who do not have access to other pension arrangements. To receive the full basic State Pension, individuals must have 30 qualifying years of National Insurance contributions or credits. The basic amount of the State Pension depends on contributions made throughout an individual's working life, with a minimum of £141.85 per week for those who meet the eligibility criteria.

Deferring receipt of the State Pension allows individuals to receive an increased entitlement, dependent on the number of weeks deferred. For every five weeks of deferral, the individual's State Pension is increased by 1% up to a maximum of 10.4% after one year of deferral. This increase in entitlements is designed to incentivize individuals to defer receipt and continue working, contributing to the economy and reducing the burden on the state pension system. Even though the deferral rate is quite generous, it is unexpected that only a few individuals delay receiving their state pension. According to research conducted by Crawford and Tetlow in 2010 (Crawford and Tetlow, 2008 and Cribb et al., 2016) using data from the English Longitudinal Study of Ageing, merely 5% of people aged between the SPA and 75 in 2008-09 had chosen to defer their state pension.

### *2.2 Theoretical Mechanisms*

The impact of parental retirement on the well-being of adult children is a priori ambiguous. On the one hand, parental retirement can lead to positive outcomes for adult children, such as increased leisure time, working hours, and life satisfaction. On the other

hand, it may also have adverse effects, such as increasing informal care- hours and decreasing financial resources, which could negatively impact the latter's well-being. In this paper, we focus on five theoretical channels that may drive the effect of parental retirement on adult children's well-being.

First, we hypothesize that retirement directly affects time transfers between parents and adult children. Based on the literature on retirement's physical and mental health consequences, the first kind of time transfer may occur from adult children through informal care hours dedicated to their parents. Evidence in this field is somewhat mixed, with studies in the United Kingdom showing adverse effects on health and mental well-being (Carrino et al., 2020, and Fé and Hollingsworth, 2016). Following retirement, parents may necessitate more informal care and support from their offspring. This channel, in turn, may deteriorate adult children's satisfaction in several life domains (see Lacey et al., 2019).

At the same time, retirement may increase grandparents' time available to provide childcare, as discussed in Eibich and Siedler (2020). This increased availability of grandparental childcare could positively impact adult children's well-being, particularly for daughters who often face a "child penalty" regarding their career prospects and earning potential. Recent pieces of evidence from Kaufmann et al. (2022) suggest that access to grandmother childcare reduces the child penalty and leads to a higher labor supply level for adult daughters and better educational outcomes for grandchildren. However, it is worth noting that the availability and quality of grandparental childcare can vary significantly based on geographical distance, health, and family dynamics.

The third and fourth hypotheses look at financial transfers. First, results from several papers suggest that retirement negatively impacts retirees' wealth and living standards (see Cribb et al., 2022), which may increase their demand for financial support from their adult children. At the same time, the diminishing wealth of retirees' parents may damage those adult children that rely financially on their parents, negatively affecting their well-being. However, offsetting the rising costs of financially supporting their parents, the savings from adult children with children may benefit from reducing childcare expenses.

Overall, the effect of these four potentially simultaneous channels on adult children's well-being is ambiguous and may be highly heterogeneous in the adult children population. Therefore, it is crucial to understand which population segment is more exposed to the ripple effects of parental retirement.

# 3 Data

We analyze longitudinal data from the British Household Panel Survey (BHPS wave 1-18) and the UK Household Longitudinal Study (Understanding Society waves 1-12) from 1991 to 2022. BHPS began in 1991 with 5,000 households and expanded to include additional households from Scotland, Wales, and Northern Ireland. In 2008, BHPS participants were allowed to join Understanding Society, a more wide-ranging survey. Approximately 6,700 out of 8,000 asked participants joined. Understanding Society (UKHLS) started in 2008 with approximately 40,000 households and is ongoing.

The BHPS and UKHLS surveys survey all members of participating households who are 16 years old or older. When participating members leave the household (for instance, when children move out of their parent's home or parents get divorced), their new household becomes part of the panel. This survey design allows for a direct linkage between comprehensive data on adult children and the socio-economic characteristics of their parents over time.

We construct the sample by linking each child in a household to their biological mother and father. If the child lives with a stepfather/mother or a father/mother-in-law, we also consider this. When an adult child participant begins cohabitating with a spouse, the new member inherits the information regarding their partner's mother and father. This procedure results in an unbalanced panel dataset. Appendix A contains more information on the initial sample composition and attrition analysis.

We have brought together these two sets of data in two different causal identification settings. Our first approach uses the State Pension Age for mothers and fathers as a cutoff point in a Fuzzy Regression Discontinuity Design with instrumental variable estimation. The second approach exploits a pension reform that took effect in April 2010,

which gradually raised the state pension age from 60 to 66 over ten years for females born after April 1950. From 2018, also men born after 1953 were treated. Using a Difference-in-Differences design, we are leveraging this exogenous increase to evaluate the effect of mothers' delayed retirement on the well-being of their adult children.

### *3.1 Adult children outcomes*

This analysis focuses on the well-being of adult children around the years of their parent's retirement. We focus on four variables expressing different well-being aspects to understand the retirement spillover effects fully. Examining this battery of well-being dimensions can help identify which aspects of well-being are most affected by parental retirement, which can guide future research and interventions.

The first variable is a uni-dimensional measure of psychological distress. This measure is essential because mental health is critical to overall well-being. We derive it from the General Health Questionnaire. The General Health Questionnaire includes 12 statements to which respondents indicate agreement on a four-point scale. We sum up the responses to the 12 items, with the maximum score a respondent can get being 36 and the minimum is 0. Understanding psychological distress is essential, as mental illness among young adults can negatively affect child-rearing practices, overall family functioning, children's development, and labor market outcomes.

The second battery of variables pertains to satisfaction and includes items measured since wave 6 (1996) of BHPS onwards. All the satisfaction variables lie on a 1-7 Likert scale, where one means completely dissatisfied, seven is completely satisfied, and four is neutral.

The first is overall life satisfaction. This variable is a crucial component of overall well-being, strongly correlating with all other dimensions. The second and third variables are satisfaction with leisure time and income. These variables are important because, as our mechanisms suggest, a parent's retirement may impact an individual's financial status and time availability. Examining how retirement affects adult children's satisfaction with their leisure time and income can provide insights into the impact of inter-generational

transfer of time and money on well-being.

### *3.2 Retirement, pension eligibility, age*

If they self-reported being retired, we would define parents as retired at the month and year of the interview. The treatment is retirement. We assume that retirement is a defining treatment so that once respondents retire, they remain in retirement for the rest of their life, i.e., they can switch to retirement just once. However, in the sensitivity analysis, we modify the retirement definition in two ways. First, we consider retired parents who were unemployed and not actively looking for jobs the month before the interview. Second, we define retired as those parents receiving a pension income.

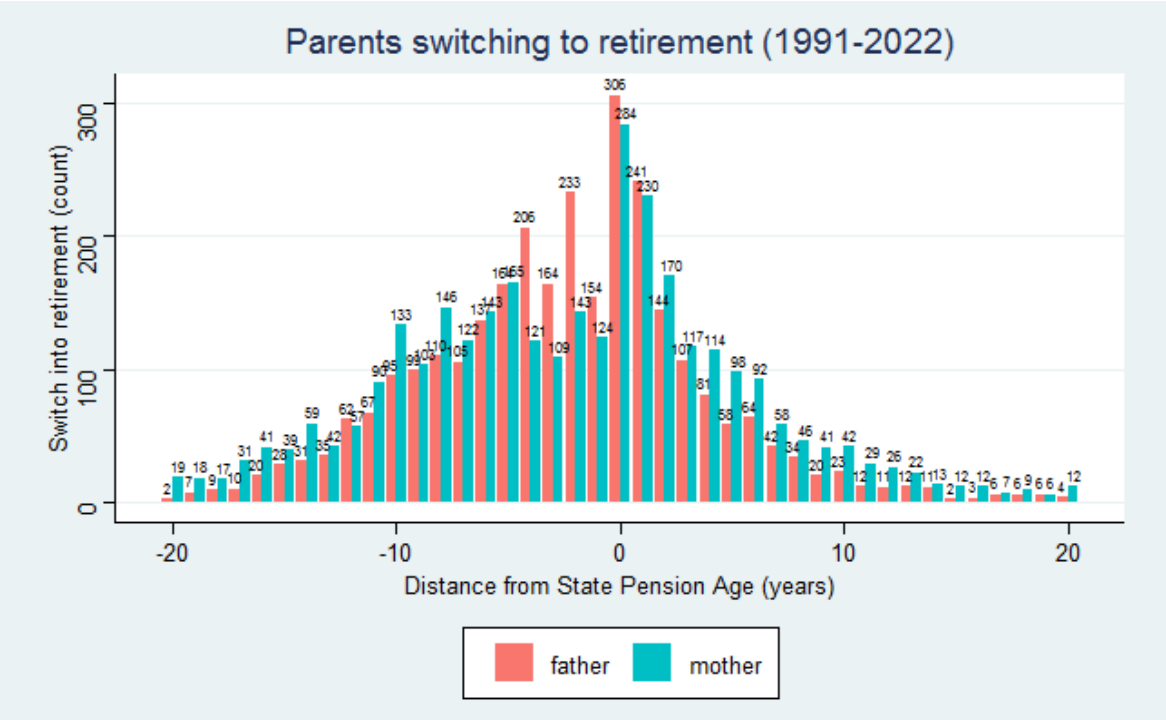
Figure 1 illustrate the number of parents that switched to retirement as a function of the distance from their State Pension Age. Over the entire analysis period, from 1991 to 2022, we observe 1313 mothers and 1124 fathers entering retirement. For both parents, most of the transitions occurred at the mandatory SPA. However, a non-negligible proportion of parents retire prior to reaching the SPA.

In the UK, in the period covered (1991-2019), the state pension eligibility age has significantly changed for mothers. Before April 2010, the State Pension Age for male workers was 65 years old, and for female workers was 60. In figure 2, we illustrate the share of a retired parents as a function of their age, stratifying the sample by treatment cohorts.

Mothers born since April 1950 faced different State Pension Ages from April 2010 onward, and fathers born since December 1953 faced different State Pension ages from December 2018 onwards. The effect of this policy is apparent. Compared to the control group (the untreated), the treatment groups have a lower retirement probability at 60 and 65, which recoup only after at least four years.

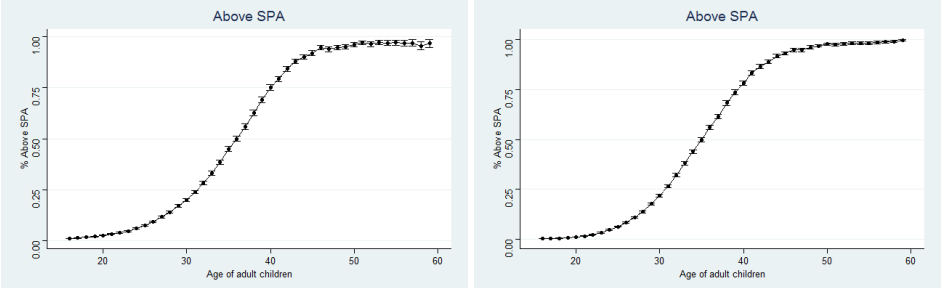
Finally, figure 3 shows the shares of fathers and mothers above the SPA thresholds by adult children's ages, respectively. Similarly to what has been found by Eibich and Siedler (2020), less than 20 percent of parents have reached the State Pension Age threshold before their child's 25th birthday. Moreover, when the adult child turns 45, almost all parents have passed the State Pension Age. Therefore, we limit the sample to adult chil-

FIGURE 1: UKHLS and BHPS pooled sample (1991-2022). Count of parents switching to retirement as a function of the distance to the SPA, in year




dren aged 20-45 since parental retirement is a rare event outside this range. We test the sensitivity of our results to this choice; results and discussion are in Appendix.

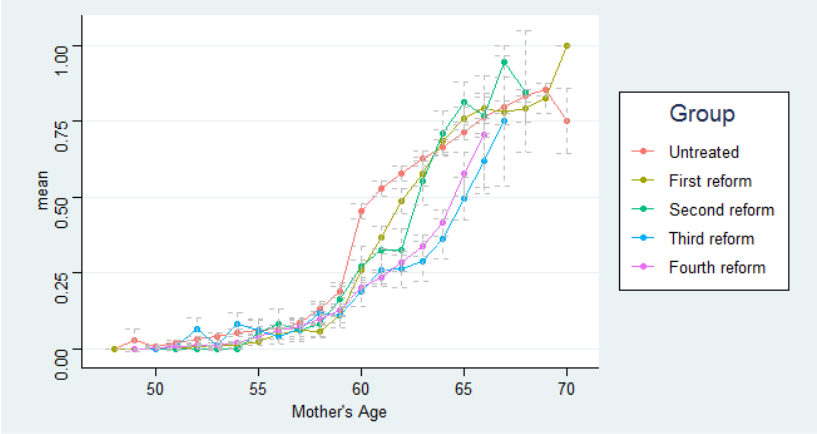
FIGURE 3: UKHLS and BHPS pooled sample (1991-2022). The panels show the share of fathers (left) and mothers (right) above the State Pension Age(at ages 60 and 65, respectively) by adult children's ages.



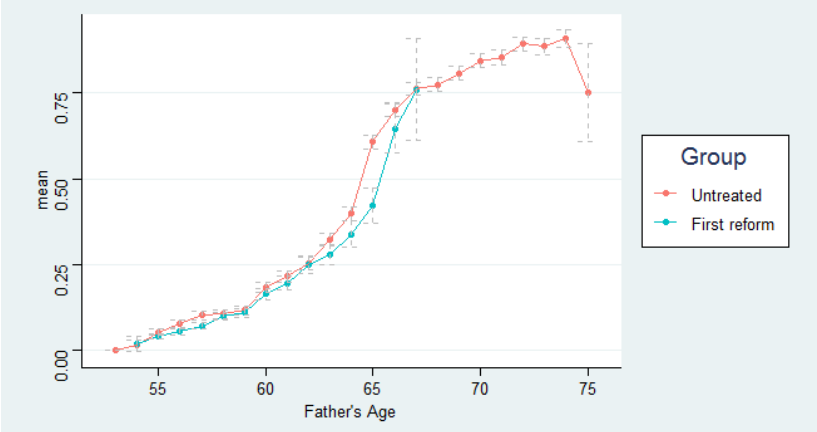

# 4 Empirical methodology

Parental retirement is likely endogenous for their adult children's well-being since older parents might retire voluntarily to assist their children with childcare, household chores, and support in general. In this paper, we address this problem using two different identification strategies. In line with other authors (see Coe and Zamarro, 2011, Gorry et al.,

FIGURE 2: The figure shows the share of retired parents by age, for different cohorts based on their exposure to pension reforms




(A) Mothers' retirement probability




(B) Fathers' retirement probability

2018, Eibich and Siedler, 2020), the first strategy exploits the age threshold for pension eligibility (at age 60 for mothers 65 for fathers) as an exogenous variation in parental retirement in a fuzzy regression discontinuity design and a two-stage least-square estimation strategy. Since state pension eligibility is tied to passing the relevant threshold, being above the age threshold should be associated with a considerable discontinuity in the probability of retiring.

The second identification strategy exploits two recently implemented Pension Acts that, starting in April 2010, gradually increased the SPA from 60 to 66 years old in ten years. The reforms affected women born after March 1950 and men born after March 1953. We use a difference-in-differences analysis to compare adult children's well-being of parents subject to different State Pension Ages.

### *4.1 Fuzzy regression discontinuity design*

The first identification strategy is based on the assumption that older parents prefer to retire once they are eligible for a state pension, which in the UK is likely to represent an important source of their retirement income.

In a fuzzy RD design, we need two further assumptions for a causal interpretation of the effect. First, being above or below the age threshold should not directly affect the well-being of adult children. While parental age might be related to adult children's well-being, a discontinuous increase in well-being at the SPA appears unlikely. Thus, this assumption is likely to hold conditional on a continuous trend in parental age. Second, we assume that parents are not able to manipulate whether they are above or below the threshold. With age in months as the running variable for the threshold, this assumption should hold by construction. To ensure this assumption hold, we run density continuity tests of the assignment variable, see section 4.1.1.

Based on these prior assumptions, we estimate a causal effect of parental retirement on the four well-being outcomes. Our empirical model is written as follows:

$$r_{it} = \alpha + f_1(\text{age}_{it}) + g_1(\text{page}_{it}) + \pi D_{it} + \omega_i + \kappa_t + \nu_{it} \quad \text{first stage} \tag{4.1}$$

$$y_{it} = \beta + f_2(\text{age}_{it}) + g_2(\text{page}_{it}) + \lambda r_{it} + \xi_i + \tau_t + \epsilon_{it} \quad \text{second stage} \tag{4.2}$$

where $y_{it}$ is the well being outcome of adult child $i$ at time $t$, $\text{age}_{it}$ is the age of adult child $i$, $\text{page}_{it}$ is the parent age (in month) of adult child $i$, $r_i$ indicates the retirement status of adult child $i$'s parent. $\alpha_i$ and $\omega_i$ are adult child-fixed effects and $\tau_t$ and $\kappa_t$ are year and month fixed effects to control for secular and seasonal trend. $\epsilon_{it}$ and $\nu_{it}$ are the idiosyncratic errors of the second and first stage, respectively. $f(\text{age}_{it})$ and $g(\text{page}_{it})$ are the parametric functions of the child's and the parents' age, respectively. The variable $\text{age}_{it}$ and $\text{page}_{it}$ are both measured in age (for now). $D_{it}$ is a dummy variable indicating whether the parent of adult child $i$ in time $t$ is above or below the state pension age. In the first stage, the parameter $\pi$ measures the effect of crossing the age threshold on the retirement probability of the parent. In the second stage, $\lambda$ is the treatment effect of parental retirement on child's well-being.

We estimate the model using the two-stage least squares method to derive the causal estimate of the parameter. We use a bandwidth of 10 years for both mothers and fathers (i.e. we only include observations in which the mother is between 50 and 70 and the father is between 55 and 75) and a quadratic trend for the parent and adult child age as our main specification. We use standard error clustered at the individual level. We check the sensitivity of the results at different age bandwidth thresholds.

### *4.1.1 Assumptions*

*Smoothness in density*: For an RDD design to be valid, individuals must not manipulate the assignment variable, which, in our case, is the parent's age in months. We run continuity density tests around the cutoff for mothers and fathers separately to test the continuity in the parent's age range. The density test consists of a null hypothesis that the density of the running variable is continuous at the cutoff. In other words, the null hypothesis is that there is no "manipulation" of the density at the cutoff. Failing to reject

implies no statistical evidence of manipulation at the cutoff (Cattaneo et al., 2019). Results from this test confirm the absence of manipulation around the cutoff (see Appendix B).

*Choice of bandwidth*: One of the most critical decisions in RDD is selecting the appropriate bandwidth around the cutoff. This parameter establishes the maximum age range from the discontinuity. Observations beyond this range are unused. Choosing a narrow bandwidth minimizes bias, but it may increase variance due to a smaller number of observations. On the other hand, selecting a larger bandwidth reduces variance but can potentially increase bias. In the main specification, we use a bandwidth of ten years, covering ages 50 to 70 for mothers and 55 to 75 for fathers. We perform robustness checks with bandwidths of eight, five and three years.

*Smoothness in covariates:* One fundamental assumption of the RD design is that other predetermined characteristics of the parents and adult children that may affect adult children's well-being should not change discontinuously at the threshold. Parents' predetermined variables include race, high-school degree, and years of education. Adult children predetermined covariates are race, female/male ratio, years of education, and degree. In Appendix B, we illustrate the RD plot for children, mothers, and fathers, overlaid with lines from local linear regressions using data within $\pm 10$ years window. The graphs show no visible discontinuities at the cutoff, indicating that local assignment around the cutoff is random. Overall, the RD validity checks support our empirical strategy and provide no evidence of violations of the key identifying assumptions.

*Instrument validity:* There are three conditions necessary to interpret the two-stage least squares estimate. First, parents' age is strongly associated with retirement status. We show the validity and magnitude of the first-stage relationship in Section 4.1.3. Second, we need to assume that parents' age only impacts adult children's outcomes through the change in retirement probability. This assumption might be violated if adult children anticipate their parent's eligibility for a state pension and adjust their well-being accordingly.

### 4.1.2 *Descriptive statistics*

The main analysis in the RDD design will refer to adult children and their spouses aged 20–45 years and parents within ±10 years around the Pension Eligibility threshold. We drop parents that never worked (510 mothers and 282 fathers). This sample selection produces around 24495 observations*year in the mother sample and 17210 in the father sample. The data cover information on around 4337 adult children, 2029 mothers and 1277 fathers.

This section presents the descriptive statistics of the sample used in the Fuzzy RDD-IV. We divide the sample into fathers and mothers sample. The difference between the two samples is due to the presence of alone mothers and alone fathers. Hence adult children in the two samples are slightly different.

TABLE 1: RDD sample descriptive statistics

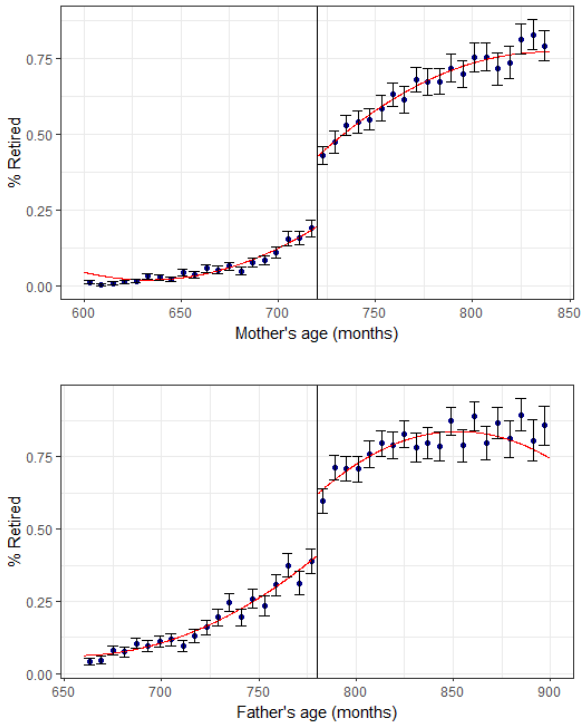
| | Mother sample | | | | Father sample | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | N | Individuals | Mean or Freq | Sd or Perc | N | Individuals | Mean or Freq | Sd or Perc |
| *A. Adult children outcomes* | | | | | | | | |
| GHQ | 24495 | 4337 | 25.3 | 5.3 | 17210 | 3133 | 25.3 | 5.3 |
| Life Satisfaction | 21050 | 4122 | 5.2 | 1.1 | 15124 | 3027 | 5.2 | 1.1 |
| Income satisfaction | 21080 | 4117 | 4.5 | 1.5 | 15149 | 3025 | 4.5 | 1.4 |
| Leisure Satisfaction | 21086 | 4123 | 4.5 | 1.5 | 15153 | 3028 | 4.5 | 1.5 |
| *A. Adult children characteristics* | | | | | | | | |
| Age | 29887 | 5289 | 29.1 | 5.7 | 20981 | 3836 | 29.9 | 5.7 |
| Married | 29813 | 5287 | 0.3 | 0.5 | 20929 | 3835 | 0.3 | 0.5 |
| School leaving age | 22812 | 3702 | 16.4 | 1.0 | 16315 | 2704 | 16.4 | 1.0 |
| Female | 29887 | 5289 | 0.46 | 0.5 | 20981 | 3836 | 0.46 | 0.5 |
| Active in labor market | 26869 | 4637 | 0.8 | 0.4 | 18872 | 3358 | 0.9 | 0.3 |
| Number of children | 29887 | 5289 | 0.5 | 0.9 | 20981 | 3836 | 0.6 | 0.9 |
| Full time job | 21727 | 4168 | 0.9 | 0.3 | 15415 | 3009 | 0.9 | 0.4 |
| Hours work | 26645 | 4674 | 32.7 | 18.9 | 18747 | 3388 | 32.9 | 18.7 |
| Individual income (gross) | 24997 | 4384 | 1363.0 | 1092.9 | 17563 | 3172 | 1432.1 | 1132.3 |
| Live with father | 29887 | 5289 | 0.3 | 0.4 | 20981 | 3836 | 0.3 | 0.5 |
| Live with mother | 29887 | 5289 | 0.3 | 0.5 | 20981 | 3836 | 0.3 | 0.5 |
| Live in London | 29671 | 5251 | 0.1 | 0.3 | 20866 | 3812 | 0.1 | 0.3 |
| White | 28802 | 4909 | 0.8 | 0.4 | 20133 | 3543 | 0.8 | 0.4 |
| Distance (KM) | 22546 | 4556 | 19.3 | 60.0 | 14746 | 3101 | 20.3 | 60.4 |
| *B. Parent* | | | | | | | | |
| GHQ | 23170 | 2029 | 24.1 | 5.6 | 13761 | 1277 | 25.7 | 4.5 |
| Retired | 24996 | 2131 | 0.2 | 0.4 | 15182 | 1372 | 0.3 | 0.5 |
| Above SPA | 29883 | 2365 | 0.3 | 0.4 | 20981 | 1725 | 0.2 | 0.4 |
| Age | 29887 | 2365 | 56.8 | 5.0 | 20981 | 1725 | 61.2 | 5.0 |
| Number of child | 29887 | 2365 | 2.5 | 1.4 | 20981 | 1725 | 2.5 | 1.3 |
| School leaving age | 28402 | 2159 | 15.7 | 1.2 | 19156 | 1499 | 15.6 | 1.3 |
| Full time job | 13606 | 1474 | 0.5 | 0.5 | 8703 | 1000 | 0.9 | 0.3 |
| Weekly hours work | 24873 | 2160 | 15.7 | 17.0 | 15732 | 1471 | 22.6 | 22.6 |
| Individual income (gross) | 23811 | 2053 | 827.1 | 879.0 | 14135 | 1290 | 1553.8 | 1562.4 |

### 4.1.3 *Graphical evidence*

The mandatory State Pension Age provides an exogenous shock to retirement decisions. Figure 7 shows that the retirement rate has a non-negligible jump around the cut-off. There is an apparent increase in the retirement rate for both mother and father, suggesting that people comply with the mandatory retirement policy. The graph for the father

also seems to suggest the presence of a discontinuity ten months before the thresholds, which may correspond to the age at which spouses retire. Thus, our RD estimates can be interpreted as valid intent-to-treatment effects of parental retirement on adult children's well-being, as long as other observed factors affecting parental retirement do not change discontinuously right around the cut-off.

FIGURE 4: Parents' propensity to retire by age. BHPS, own calculations. The dots show the share of retired parents in the analyzed sample over bins of six months. The vertical lines mark State Pension Age in the UK. The red line indicated local polynomial fit




### *4.2 Difference-in-Differences*

The second identification strategy exploits the recently implemented UK pension Acts of 1995 and 2011, which gradually raises the state pension age for women from 60 to 66 over ten years (April 2010- October 2020), and for men from 65 to 66 over over two years (December 2018- October 2020).

We estimate the impact of increasing the state pension age on different dimensions of adult children's well-being, exploiting the fact that we have data on the well-being of otherwise similar adult children for which parents face different state pension ages. We identify the effect through difference-in-differences methodology in the same way as

Cribb et al. (2016), Della Giusta and Longhi (2021), and Cribb et al. (2022) who estimated the impact of the same reforms on retirees' labor market behavior and well being. Specifically, we estimate the following model:

$$y_{it} = \alpha T_{it} + \alpha_i + \gamma_t + \sum_{\text{pa}=50,55}^{70,75} \delta[\text{page}_{it} == \text{pa})] + X_{it}\theta + \epsilon_{it} \tag{4.3}$$

where the outcome of interest $y_{it}$ for adult children $i$, and observed in time period $t$ is allowed to vary by whether his/her parent is aged below or above the state pension age (T) plus a set of controls for parents and adult children. The controls includes, adult children age in months, adult children marital status, elderly parents and adult children home ownership and an indicator whether adult children and parents are living in the same households. The dummy $T_{it}$ measures whether, at the point the adult children are observed, mothers or fathers have not reached their state pension age. This is constructed by comparing the adult children date of interview in the survey, to parents state pension dates (which depends on their date of birth). Given the nature of the reform, this is an interaction term between an individual's cohort and age.

Our DiD sample includes mothers born from 1935 to 1965, aged 50 to 70, and fathers born between 1938 and 1968, aged 55 to 75. This means that the difference-in-differences estimator essentially compares adult children's outcomes of 15 cohorts of parents who are unaffected by the reform (1935-March 1950), with the following 15 cohorts (April 1950-1965), who are affected by the gradual in increasing state pension ages. Descriptive statistics of the Diff-in-Diff sample are in Appendix D.

# 5 Results

### *5.1 Short-Run Spillover Effects: Direct and Indirect Effects*

In the following sections, we first investigate the direct impact of reaching the State Pension Age on parents' well-being outcomes. We look at weekly hours worked, leisure time satisfaction, subjective financial situation, and physical and mental health. Then, we estimate the indirect spillover effects on adult children's well-being. Subsequently, we strat-

ify the adult children sample in three ways to investigate the underlying mechanisms. First, we select only adult children responsible for one or more children under the age of 12. Second, we stratified the sample by geographical distance between adult children and parents. Third, we stratified the sample by adult children's income bandwidth. All the variables for stratification come from the years before parents reached their State Pension Age.

### *5.2 Retirement Effects on Parents Labor Supply and Well-Being: Direct effect*

In this section, we report the direct effects of retirement on labor supply and well being of retirees' parents. Before looking at the second stage results, it is worth commenting on the first stage IV results. The first stage results accurately estimate the probability of retirement at 60 and 65, based on crossing the eligibility age for a state pension. The findings reveal a significant increase in the probability of retirement for both mothers and fathers when crossing the age threshold, with mothers having a 30% increase and fathers having a 31% increase. This finding indicates that the SPA cutoff is a sufficiently strong instruments for parental retirement status, with F-statistics much higher than the rule-of-thumb F-statistic of 10–12 (Staiger and Stock, 1994).

Thus, we analyze the causal effect of retirement on five different retirees' outcomes that match the theoretical mechanisms outlined in Section 2.2. The first is the number of hours parents worked in a week. After self-declaring retirement, we expect weekly working hours to decrease. That is the case for mothers and fathers, as reported in column (1) in Tables 2 and 3. A one standard deviation increase in the probability of retiring reduces by 0.97 and 1.2 standard deviations the weekly working hours for the mother and father, respectively. Second, we expect leisure satisfaction to increase, as after retirement, parents may enjoy more leisure time than before retirement. Leisure satisfaction (column (2)) significantly increases by 0.75 and 0.76 standard deviations for mothers and fathers. The third analyzed outcome is the subjective financial situation. Pensions in the UK are known to be relatively low relative to labor incomes. We, therefore, expect a decrease in financial satisfaction after retirement. We estimate a negative effect (column (3)) of -0.24

and -0.52 standard deviations for mothers and fathers, respectively. Lastly, column (4) and column (5) reports the estimated effect of retirement on retirees' mental health and subjective health, respectively. Mental health significantly increases by 0.32 standard deviations for mothers and 0.27 standard deviations for fathers. Subjective health increases only for mothers by 0.23 standard deviations.

The estimated direct effects of retirement on the selected parental outcomes reinforced or cleared out some of the mechanisms outlined in section 2.2. The significant and positive effect of retirement on maternal mental and subjective physical health can be attributed to a reduction in stress levels and increased leisure time, which allows them to engage in activities that promote their overall well-being. As a result, this positive effect makes it less likely that elderly parents would require informal care from their adult children. At the same time, the positive effect on leisure satisfaction and the negative effect on financial situation leaves the remaining channels still plausible.

TABLE 2: Mother retirement and mother labor supply and well being. *Note*: All models include individual,year and month fixed effects. The models include a quadratic trend for the child and mother' age. Bandwidth of 10 years. The coefficients are standardized.

| Dependent Variables: | Weekly working hours (1) | Leisure Satisfaction (2) | Financial Situation (3) | GHQ (4) | Subjective health (5) |
|---|---|---|---|---|---|
| **Second-stage IV results** | | | | | |
| mother retired | -0.97*** | 0.75*** | -0.24** | 0.32** | 0.23** |
| | (0.11) | (0.14) | (0.12) | (0.14) | (0.11) |
| $R^2$ | 0.796 | 0.601 | 0.635 | 0.576 | 0.664 |
| **First-stage IV results** | | | | | |
| mother above SPA | 0.30*** | 0.30*** | 0.30*** | 0.30*** | 0.30*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| F-test | 2068.2 | 1740.5 | 2015.8 | 1920.6 | 2098.6 $R^2$ |
| **Reduce Form** | | | | | |
| mother above SPA | -0.28*** | 0.22*** | -0.07** | 0.10** | 0.07** |
| | (0.04) | (0.04) | (0.04) | (0.04) | (0.03) |
| $R^2$ | 0.773 | 0.607 | 0.639 | 0.578 | 0.665 |
| **OLS** | | | | | |
| mother retired | -0.72*** | 0.33*** | 0.03 | 0.11** | 0.04 |
| | (0.04) | (0.05) | (0.04) | (0.04) | (0.03) |
| $R^2$ | 0.8 | 0.610 | 0.638 | 0.578 | 0.665 |
| Observations | 24,584 | 19,663 | 24,151 | 23,136 | 24,614 |

*Clustered (mother) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE 3: Father retirement and father labor supply and well being. *Note*: All models include individual,year and month fixed effects. The models include a quadratic trend for the child and mother' age. Bandwidth of 10 years. The coefficients are standardized.

| Dependent Variables: | Weekly working hours (1) | Leisure Satisfaction (2) | Financial Situation (3) | GHQ (4) | Subjective health (5) |
|---|---|---|---|---|---|
| **Second-stage IV results** | | | | | |
| father retired | -1.2*** | 0.76*** | -0.52*** | 0.27** | -0.04 |
| | (0.14) | (0.20) | (0.17) | (0.14) | (0.15) |
| $R^2$ | 0.823 | 0.644 | 0.62 | 0.596 | 0.67 |
| **First-stage IV results** | | | | | |
| father above SPA | 0.31*** | 0.29*** | 0.31*** | 0.31*** | 0.31*** |
| | (0.03) | (0.04) | (0.03) | (0.03) | (0.03) |
| F-test | 1139 | 816.3 | 1083.8 | 1028 | 1126.2 |
| **Reduced form** | | | | | |
| father above SPA | -0.35*** | 0.22*** | -0.16*** | 0.08* | -0.01 |
| | (0.05) | (0.06) | (0.05) | (0.04) | (0.05) |
| $R^2$ | 0.773 | 0.607 | 0.639 | 0.578 | 0.665 |
| **OLS** | | | | | |
| father retired | -1.0*** | 0.55*** | 0.06 | 0.11** | -0.003 |
| | (0.05) | (0.06) | (0.05) | (0.05) | (0.05) |
| $R^2$ | 0.824 | 0.647 | 0.639 | 0.598 | 0.67 |
| Observations | 14,867 | 11,824 | 14,286 | 13,744 | 14,869 |

*Clustered (father) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

### *5.3 Effects on Adult Well-Being: Spillover Effects*

Table 4 and Table 5 provide the main estimates of the effect of parental retirement on the battery of adult children's well-being outcomes. We present findings for a quadratic age trend and a bandwidth of ten years before and after the cutoff. We report the effects of the mother's retirement in Table 4, while the effects of the father's retirement in Table 5. We show estimated coefficients for the pooled sample of all adult children and separately for adult daughters and adult sons.

First, we find that the mothers' retirement significantly increases adult children's life satisfaction and income satisfaction. Second, the estimates in the first row of Table 4 suggest that the effect on daughters drives the effect of mother retirement on life satisfaction. In contrast, the effect on sons drives the effect on income satisfaction. Mother retirement increases life satisfaction by 0.22 standard deviations for all children and 0.26 standard deviations for daughters, while the effect is insignificant for sons. Similarly, maternal retirement increases by 0.19 standard deviations in income satisfaction for all children and by 0.23 standard deviations for sons, while it is insignificant for adult daughters. Finally,

we found a significant effect of maternal retirement on daughters' mental health, but the effect is almost zero and insignificant for sons. Third, Table 5 shows that the estimates (incl. the reduced form coefficients) for paternal retirement are insignificant, smaller, and less precisely estimated than for maternal retirement. Overall, the first RDD-IV results in Table 4 and Table 5 show that only mother's retirement has a positive effect on the well-being of their adult children.

TABLE 4: Mother retirement and adult children's well-being. *Note*: The models include a quadratic trend for the child and parents' age. Individual, month and year fixed effects. Age bandwidth of ten years. The coefficients are standardized.

| *panel A* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent Variables: | Life satisfaction | | | Income satisfaction | | | Leisure satisfaction | | | GHQ | | |
| | All | Daughters | Sons | All | Daughters | Sons | All | Daughters | Sons | All | Daughters | Sons |
| **Second-stage IV results** | | | | | | | | | | | | |
| mother retirement | 0.22** | 0.26* | 0.19 | 0.19** | 0.16 | 0.23* | -0.02 | -0.01 | -0.03 | 0.12 | 0.25* | 0.003 |
| | (0.10) | (0.14) | (0.14) | (0.09) | (0.14) | (0.13) | (0.10) | (0.15) | (0.14) | (0.10) | (0.14) | (0.12) |
| Observations | 17,403 | 8,516 | 8,887 | 17,424 | 8,538 | 8,886 | 17,431 | 8,532 | 8,899 | 20,468 | 9,927 | 10,541 |
| F-test | 1601.2 | 765.9 | 828.8 | 1603.8 | 762.8 | 836.2 | 1592.5 | 762.8 | 824.6 | 1840.1 | 920.2 | 912.3 |
| $R^2$ | 0.575 | 0.563 | 0.584 | 0.572 | 0.570 | 0.575 | 0.546 | 0.533 | 0.559 | 0.485 | 0.464 | 0.499 |
| **Reduced form** | | | | | | | | | | | | |
| mother above SPA | 0.06** | 0.06 | 0.05 | 0.04* | 0.03 | 0.06* | 0.01 | 0.02 | 0.004 | 0.03 | 0.06 | 0.001 |
| | (0.03) | (0.04) | (0.04) | (0.02) | (0.04) | (0.03) | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.03) |
| Observations | 21,050 | 10,415 | 10,635 | 21,080 | 10,443 | 10,637 | 21,086 | 10,436 | 10,650 | 24,495 | 12,001 | 12,494 |
| $R^2$ | 0.571 | 0.563 | 0.577 | 0.570 | 0.570 | 0.572 | 0.473 | 0.526 | 0.554 | 0.473 | 0.450 | 0.490 |
| **OLS** | | | | | | | | | | | | |
| mother retired | 0.02 | -0.004 | 0.03 | 0.02 | -0.002 | 0.04 | 0.0004 | -0.02 | 0.02 | 0.003 | 0.02 | -0.009 |
| | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.03) |
| Observations | 17,424 | 8,516 | 8,887 | 17,424 | 8,538 | 8,886 | 17,431 | 8,532 | 8,899 | 20,468 | 9,927 | 10,541 |
| $R^2$ | 0.573 | 0.566 | 0.584 | 0.573 | 0.571 | 0.577 | 0.546 | 0.533 | 0.56 | 0.486 | 0.467 | 0.499 |

*Heteroskedasticity-robust standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE 5: Father retirement and adult children's well-being. *Note*: The models include a quadratic trend for the child and parents' age. All models include adult children fixed effects, and year and month fixed effects. Age bandwidth of ten years. The coefficients are all standardized.

| *panel B* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent Variables: | Life satisfaction | | | Income satisfaction | | | Leisure satisfaction | | | GHQ | | |
| | All | Daughter | Son | All | Daughter | Son | All | Daughter | Son | All | Daughter | Son |
| **Second-stage IV results** | | | | | | | | | | | | |
| father retired | 0.07 | 0.13 | 0.008 | -0.07 | -0.17 | 0.02 | 0.09 | 0.05 | 0.12 | -0.06 | 0.06 | -0.16 |
| | (0.14) | (0.18) | (0.20) | (0.13) | (0.19) | (0.19) | (0.14) | (0.20) | (0.19) | (0.13) | (0.19) | (0.17) |
| Observations | 10,950 | 5,286 | 5,664 | 10,967 | 5,309 | 5,658 | 10,975 | 5,303 | 5,672 | 12,705 | 6,102 | 6,603 |
| F-test | 733.9 | 375.5 | 361.7 | 737.8 | 381.6 | 360.1 | 732.5 | 375.7 | 360.3 | 970.3 | 479.9 | 488.7 |
| $R^2$ | 0.587 | 0.591 | 0.583 | 0.592 | 0.593 | 0.592 | 0.555 | 0.543 | 0.568 | 0.505 | 0.473 | 0.538 |
| **Reduced form** | | | | | | | | | | | | |
| father above SPA | 0.02 | -0.002 | 0.04 | -0.02 | -0.04 | 0.002 | 0.002 | -0.02 | 0.02 | -0.03 | -0.03 | -0.02 |
| | (0.03) | (0.05) | (0.05) | (0.03) | (0.05) | (0.04) | (0.03) | (0.05) | (0.04) | (0.03) | (0.05) | (0.04) |
| Observations | 15,124 | 7,487 | 7,637 | 15,149 | 7,516 | 7,633 | 15,153 | 7,506 | 7,647 | 17,210 | 8,441 | 8,769 |
| $R^2$ | 0.575 | 0.574 | 0.574 | 0.587 | 0.588 | 0.588 | 0.546 | 0.534 | 0.56 | 0.487 | 0.459 | 0.512 |
| **OLS** | | | | | | | | | | | | |
| father retired | 0.05 | -0.01 | -0.01 | 0.05 | 0.08 | 0.02 | 0.04 | -0.02 | 0.11** | -0.01 | -0.0008 | -0.02 |
| | (0.04) | (0.05) | (0.07) | (0.04) | (0.05) | (0.05) | (0.04) | (0.06) | (0.05) | (0.04) | (0.06) | (0.05) |
| Observations | 10,967 | 5,286 | 5,664 | 10,967 | 5,309 | 5,658 | 10,975 | 5,303 | 5,672 | 12,705 | 6,102 | 6,603 |
| $R^2$ | 0.592 | 0.592 | 0.583 | 0.592 | 0.596 | 0.592 | 0.555 | 0.543 | 0.568 | 0.506 | 0.473 | 0.537 |

*Clustered (individual) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

### *5.4 Heterogeneous effect*

First, we look at the effect size when adult children also have children, comparing coefficients for different grandchildren's ages. Indeed, if childcare from grandmothers positively affects daughters' life satisfaction and mental health, we would expect to find significant coefficients only for adult children with children. Moreover, recent evidence from Kaufmann et al. (2022) highlights a heterogeneous effect of maternal retirement on daughters' labor supply depending on grandchildren's age ranges. They find an increase in adult daughters working hours after maternal retirement only when children are between 4 and 7 years old. We, therefore, expect differential effect sizes depending on grandchildren's ages. Table 6 shows the heterogeneous effects. We report the estimates for the specification with a quadratic age trend and a bandwidth of 10 years (as in Table 2). The table distinguishes between parents and adult children without children and with children of different age ranges before maternal retirement. We estimate separate models for each of these groups. The results displayed to meet our expectations. Maternal retirement does not significantly affect childless adult children in any well-being dimension. For adult children with children, we found differential effects by grandchildren's

ages. Life satisfaction and mental health increase after maternal retirement by 0.45 and 0.51 standard deviations, respectively, only for adult children with grandchildren aged 5 to 11. Income satisfaction increases by 0.51 standard deviations only for adult children with children between 3 and 4 years old. These findings highlight the relevance of grandchildren caring on different well-being dimensions, depending on the grandchildren's ages. Children aged 3 to 4 are too young to enter school, and private childcare in the UK is costly. The availability of free gran-maternal childcare reduces childcare expenditures hence increasing income satisfaction. Children aged 5 to 11 enter primary schools, and gran parental support will benefit adult children allowing them to work longer and reducing stress related to combining work and family work.

Second, we might expect intergenerational support to vary by geographical distance. Indeed, Chan and Ermisch (2011) have observed a decrease in inter-generational exchange as travel distance increases in the United Kingdom. At the same time, Hank and Buber (2009: 65) have found a similar trend in their study on grand-parental childcare provision across 10 European countries. Finally, Eibich and Siedler (2020) finds a significant effect of paternal retirement on adult children's fertility that appears exclusively if the travel distance between parents and adult children is less than one hour. However, it is essential to note that the well-being of adult children could influence parents' location and retirement choices, and vice versa. Hence, the heterogeneity results in travel distance must be taken cautiously.

Table 7 illustrates significant heterogeneous effects. When the travel distance between retired mothers and their offspring is less than 1 hour, the effect on life satisfaction, income satisfaction, and mental health is substantial. Life satisfaction increases by 0.26 standard deviations, mental health increases by 0.30 standard deviations, and income satisfaction increases by 0.26 standard deviations.

Finally, we expect maternal retirement to affect adult children with a lower income level significantly. Indeed, the hypothesized mechanisms refer to the availability of retired mothers to provide free childcare to their grandchildren. For this reason, poor adult children will primarily benefit from maternal retirement, as their childcare costs will be

less affordable, and free childcare will generate higher savings relative to high-income households. We, therefore, distinguish between adult children whose monthly gross income in the year prior to their mothers reaching the state pension age was below the 25th percentile or above the 75th percentile. Table 12 shows that, as expected, adult children in the 25th household income percentile drive the positive effect of maternal retirement. Life satisfaction increases by 0.43 standard deviations for this population subgroup, and income satisfaction increases by 0.38 after maternal retirement. Interestingly, we found, for the first time, a positive effect of 0.56 standard deviations on leisure satisfaction for adult children in the 75th income percentile. The effect on leisure satisfaction is close to zero for poor adult children.

This battery of findings suggests that what drives the main estimates in Table 4 is the time transferred from retired mothers to their adult children. Taken together, the provision of free grand maternal childcare has a ripple effect on the entire family, leading to greater well-being and income satisfaction. It also sheds light on the gendered nature of childcare responsibilities and the significant role that retired mothers can play in supporting their adult children and grandchildren. Ultimately, these findings have important implications for policymakers and families, emphasizing the value of intergenerational support and the importance of recognizing and addressing the challenges faced by women in the workforce.

TABLE 6: Mother retirement and adult children's well-being- Heterogeneous effects by adult children with and without children, and by gran children ages.

| *panel A* | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent Variables: | Life satisfaction | | | | | Income satisfaction | | | | | Leisure satisfaction | | | | | GHQ | | | | |
| | No child | Child | Age 5-11 | Age 3-4 | Age 0-2 | No child | Child | Age 5-11 | Age 3-4 | Age 0-2 | No child | Child | Age 5-11 | Age 3-4 | Age 0-2 | No child | Child | Age 5-11 | Age 3-4 | Age 0-2 |
| **Second-stage IV results** | | | | | | | | | | | | | | | | | | | | |
| mother retired | 0.18 | 0.25** | 0.45** | 0.05 | 0.06 | -0.01 | 0.32*** | 0.57** | 0.31 | 0.10 | -0.04 | -0.01 | 0.37 | 0.22 | 0.17 | 0.15 | 0.10 | 0.40 | 0.13 | 0.35* |
| | (0.16) | (0.13) | (0.22) | (0.21) | (0.23) | (0.15) | (0.12) | (0.26) | (0.21) | (0.21) | (0.15) | (0.14) | (0.30) | (0.21) | (0.25) | (0.16) | (0.12) | (0.33) | (0.20) | (0.19) |
| F stat | 683.4 | 797 | 146.5 | 202.5 | 67.7 | 738.4 | 798.9 | 146.1 | 205.1 | 66.0 | 730.8 | 678.8 | 794.1 | 205.6 | 66.2 | 795.2 | 976.2 | 159.5 | 216.0 | 93.7 |
| Observations | 8,816 | 8,587 | 1,784 | 1,418 | 1,446 | 8,808 | 8,616 | 1,795 | 1,420 | 1,450 | 8,827 | 8,604 | 1,790 | 1,421 | 1,448 | 10,333 | 10,135 | 2,119 | 1,641 | 1,715 |
| $R^2$ | 0.614 | 0.533 | 0.471 | 0.534 | 0.493 | 0.606 | 0.532 | 0.452 | 0.502 | 0.528 | 0.560 | 0.511 | 0.416 | 0.507 | 0.469 | 0.515 | 0.456 | 0.403 | 0.422 | 0.457 |

*Heteroskedasticity-robust standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE 7: Mother retirement and adult children's well-being- Heterogeneous effects by travel distance.

| Dependent Variables: | Life satisfaction | | Income satisfaction | | Leisure satisfaction | | GHQ | |
|---|---|---|---|---|---|---|---|---|
| | ≤ 1 hrs | > 1 hrs | ≤ 1 hrs pct | > 1 hrs | ≤ 1 hrs | > 1 hrs | ≤ 1 hrs | > 1 hrs |
| **Second-stage IV results** | | | | | | | | |
| mother retired | 0.26* | 0.03 | 0.26** | 0.33 | -0.06 | -0.06 | 0.30** | -0.27 |
| | (0.14) | (0.27) | (0.13) | (0.26) | (0.14) | (0.29) | (0.13) | (0.32) |
| F-stat | 414.4 | 883.7 | 418.1 | 891.3 | 414.5 | 876.8 | 567.4 | 1,118.7 |
| Observations | 5,333 | 1,002 | 5,348 | 1,001 | 5,347 | 1,001 | 6,515 | 1,148 |
| $R^2$ | 0.503 | 0.467 | 0.507 | 0.451 | 0.476 | 0.442 | 0.414 | 0.386 |

*Heteroskedasticity-robust standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

TABLE 8: Mother retirement and adult children's well-being- Heterogeneous effects by income quintile.

| Dependent Variables: | Life satisfaction | | Income satisfaction | | Leisure satisfaction | | GHQ | |
|---|---|---|---|---|---|---|---|---|
| | $\leq 25^{th}$ pct | $> 75^{th}$ | $\leq 25^{th}$ pct | $> 75^{th}$ | $\leq 25^{th}$ pct | $> 75^{th}$ | $\leq 25^{th}$ pct | $> 75^{th}$ |
| **Second-stage IV results** | | | | | | | | |
| mother retired | 0.43** | 0.38 | 0.38** | 0.21 | 0.01 | 0.56* | 0.08 | 0.17 |
| | (0.17) | (0.30) | (0.15) | (0.29) | (0.15) | (0.31) | (0.14) | (0.33) |
| F-stat | 499.6 | 78.1 | 501.8 | 77.2 | 499.7 | 78.1 | 615.4 | 67.1 |
| Observations | 4,335 | 2,277 | 4,343 | 2,274 | 4,342 | 2,281 | 5,476 | 2,597 |
| $R^2$ | 0.562 | 0.482 | 0.519 | 0.500 | 0.503 | 0.434 | 0.437 | 0.406 |

*Heteroskedasticity-robust standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

### *5.5 Evidence from pension reforms*

One potential limitation of the RDD setting is the possibility of anticipation effects, where older parents and their adult children may adjust their behavior in anticipation of changes in their well-being. For example, adult children might make choices that affect their parents' propensity to retire as soon as they become eligible for state pension or their parents' overall well-being. Disentangling these alternative explanations using the RDD study design is challenging. However, using changes in policy or other external events that affect parents' eligibility for pension as an alternative source of exogenous variation can help alleviate some of these concerns and provide more robust evidence on the relationship between adult children's well-being and retirement decisions.

In the following sections, we first illustrate the direct effect on labor supply and the well-being outcomes of parents affected by the reforms. Subsequently, we evaluate the

indirect effect of the retirement age increase on adult children's well-being outcomes.

Table 9 shows the reform's impact on parents' labor market and well-being outcomes. Columns (1) suggest, in line with our previous findings and other related literature (see Cribb et al., 2016, Della Giusta and Longhi, 2021), that being below the SPA increases the parent weekly working hours by 0.18 standard deviation for mother and 0.16 standard deviation for fathers. We found a negative and significant effect of being below the State pension age on leisure satisfaction (Column 2), of 0.13 and 0.18 standard deviation, for the mother and father, respectively. Interestingly, we found a significant difference in subjective financial situation (Column 3) between fathers and mothers. For mothers, being below the SPA increases their financial situation by 0.11 standard deviations. For fathers, the effect is null and insignificant. The same appears for mental and subjective health (Column 4 and 5). We found that mothers below the SPA report mental health of 0.08 standard deviations lower than those above and subjective health of 0.09 standard deviations higher. The coefficients for retired fathers on these two outcomes are null and insignificant.

TABLE 9: Effect of being above the SPA on elderly labour supply and well-being. All coefficients are standardized. Standard errors in parenthesis are clustered by year-month of birth. All models include controls variables.

| | Weekly working hours (1) | Leisure Satisfaction (2) | Financial Situation (3) | GHQ (4) | Subjective health (5) |
|---|---|---|---|---|---|
| *panel A* | | | | | |
| **mother** below SPA | 0.18*** | -0.13*** | 0.11*** | -0.09** | -0.09* |
| | (0.04) | (0.04) | (0.03) | (0.03) | (0.05) |
| Observations | 69,818 | 62,307 | 68,845 | 65,097 | 42,232 |
| $R^2$ | 0.753 | 0.504 | 0.660 | 0.576 | 0.726 |
| *panel B* | | | | | |
| **father** below SPA | 0.16* | -0.18** | 0.07 | 0.10 | -0.06 |
| | (0.08) | (0.08) | (0.05) | (0.07) | (0.11) |
| Observations | 42,675 | 37,014 | 39,798 | 37,691 | 22,849 |
| $R^2$ | 0.74274 | 0.509 | 0.667 | 0.611 | 0.740 |

*Clustered (yearmonth birth) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Subsequently, we analyze the Pension reform effects on the battery of adult children's well-being dimensions.

Table 10 shows the results. Contrary to the RDD findings, we do not find significant

effects of the increased maternal retirement ages on any of the adult children's well-being dimensions. The effects are all close to zero and statistically insignificant. These null results may be due to anticipation effects of the reforms from adult children. This means that adult children could have anticipated the changes and adjusted their expectations and behavior accordingly, reducing the impact of the reforms on their well-being. However, the analysis shows that the increase in paternal retirement ages significantly positively affects adult children's life satisfaction and income satisfaction, which adult sons primarily drive. This finding suggests that adult sons of fathers below the retirement age are better off, as indicated by an increase of 0.20 standard deviations in life satisfaction and 0.13 standard deviations in income satisfaction.

TABLE 10: Effect of being above the SPA on adult children well-being. All coefficients are standardized. Standard errors in parenthesis are clustered at individual levels. All models include controls variables and individual,interview year and month fixed effects.

| Dependent Variables: | Life satisfaction | | | Income satisfaction | | | Leisure satisfaction | | | GHQ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | Daughters | Sons | All | Daughters | Sons | All | Daughters | Sons | All | Daughters | Sons |
| *panel A* | | | | | | | | | | | | |
| **mother** below SPA | 0.008 | 0.02 | -0.003 | 0.02 | 0.009 | 0.05 | 0.005 | 0.02 | -0.01 | -0.004 | 0.02 | -0.03 |
| | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) |
| Observations | 41,815 | 21,889 | 19,924 | 41,781 | 21,872 | 18,615 | 41,816 | 21,892 | 19,922 | 41,840 | 21,891 | 19,947 |
| $R^2$ | 0.526 | 0.515 | 0.539 | 0.545 | 0.539 | 0.556 | 0.484 | 0.470 | 0.502 | 0.554 | 0.543 | 0.557 |
| *panel B* | | | | | | | | | | | | |
| **father** below SPA | 0.11* | 0.02 | 0.20** | 0.08* | 0.11 | 0.13** | 0.09* | 0.10 | 0.10 | 0.01 | 0.04 | -0.08 |
| | (0.06) | (0.07) | (0.08) | (0.04) | (0.07) | (0.06) | (0.05) | (0.08) | (0.08) | (0.05) | (0.07) | (0.08) |
| Observations | 28,929 | 14,981 | 14,011 | 40,979 | 14,974 | 20,029 | 41,133 | 14,984 | 14,010 | 41,625 | 21,309 | 13,992 |
| $R^2$ | 0.533 | 0.524 | 0.543 | 0.534 | 0.547 | 0.540 | 0.486 | 0.488 | 0.522 | 0.532 | 0.517 | 0.576 |

*Clustered (pidp) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

### *5.6 Heterogeneous effects*

The previous section shows that when fathers wait longer for retirement, their adult sons' life and income satisfaction are positively affected. One possible explanation is that adult children financially support their fathers in retirement, which reduces their well-being. On the other hand, it is also plausible that adult children who rely on their fathers for financial support would experience lower income satisfaction and well-being when their fathers retire and experience a drop in income levels. If the first explanation is correct, we expect the positive effect on higher-income sons to be more significant because they are more likely to support their retired fathers financially. Conversely, low-income sons would be more affected if the second explanation is true. To explore this further, we ex-

amine how the effect size differs across adult children in different income quartiles. To analyse heterogeneous effects of the reform by adult children's income, we re-estimate our models as in Equation 4.3 after including an interaction term between the treatment dummy and dummies for adult children's income quartiles.

Table 11 illustrates the results. The coefficient for the treatment group (fathers above SPA) refers to adult children in the first income quartile. At the same time, the interaction term shows the differential impact on adult children in higher income bands. Results confirm the second hypothesis highlighting striking differences between adult children in different income bands. Adult children in the first quartile of the income distribution enjoy significantly higher well-being. For them, life satisfaction is higher by 0.14 standard deviation (0.23 for adult sons), higher income satisfaction by 0.13 standard deviation (0.23 for sons), and higher leisure satisfaction by 0.15 standard deviation (0.19 for sons). However, the interaction terms suggest that the effect for adult children in higher income quartiles is overall close to zero.

TABLE 11: Father retirement and adult children well-being-heterogeneity by adult children income quatiles. All models include controls variables and individual, interview year and month fixed effects.

| Dependent Variables: | Life satisfaction | | Income satisfaction | | Leisure satisfaction | | GHQ | |
|---|---|---|---|---|---|---|---|---|
| | All | Sons | All | Sons | All | Sons | All | Sons |
| father below SPA | 0.14** | 0.23*** | 0.13*** | 0.23*** | 0.15*** | 0.19** | 0.01 | 0.06 |
| | (0.05) | (0.08) | (0.05) | (0.08) | (0.06) | (0.08) | (0.05) | (0.08) |
| father below SPA × Adult child income (2nd quartile) | -0.02 | -0.06 | -0.07** | -0.11** | -0.03 | -0.08 | 0.03 | -0.08 |
| | (0.04) | (0.06) | (0.03) | (0.05) | (0.04) | (0.06) | (0.03) | (0.05) |
| father below SPA ×Adult child income (3rd quartile) | -0.06* | -0.12** | -0.07** | -0.17*** | -0.08** | -0.14** | 0.02 | -0.10* |
| | (0.03) | (0.06) | (0.04) | (0.06) | (0.04) | (0.06) | (0.04) | (0.05) |
| father below SPA × Adult child income (4th quartile) | -0.11*** | -0.12** | -0.09** | -0.17*** | -0.13*** | -0.19*** | -0.02 | -0.09* |
| | (0.04) | (0.06) | (0.04) | (0.05) | (0.04) | (0.06) | (0.04) | (0.05) |
| Observations | 40,603 | 19,873 | 40,606 | 19,858 | 40,631 | 19,879 | 41,751 | 20,441 |
| $R^2$ | 0.514 | 0.523 | 0.541 | 0.548 | 0.490 | 0.510 | 0.532 | 0.543 |

*Clustered (pidp) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

# 6 Conclusion

This paper documents the first estimates of the spillover effects of parental retirement on the well-being of adult children. We utilized data from two representative household panel studies in the UK, linking information on parents and their adult children. To estimate the effects, we employed two identification strategies. Our first strategy involved us-

ing the eligibility age for state pension for identification in an RDD setting with two stage least square estimation model. Our RDD estimates revealed that only the retirement of mothers increased the life satisfaction and income satisfaction of their adult children. Furthermore, we found that adult daughters drove the effect on life satisfaction, while sons drove the impact on income satisfaction. These effects were mainly observed in families living in close geographical proximity, in adult children who have children, varying by the ages of grandchildren, and by low-income adult children. In contrast, we found no significant effect of mothers' retirement on adult children living far without children and with high-income levels. Our RDD evidence and heterogeneity analysis highlight the importance of intergenerational time transfers from mothers. Our findings suggest that public policies should prioritize improving childcare provisions and financial affordability, notably as retirement ages have increased and will increase further.

In our second identification strategy, we analyzed the causal impact of reforms increasing the State Pension Age (SPA) for women and men in the UK. We combined a difference-in-difference approach with individual fixed effects to estimate the coefficients of interest. Our results from this strategy provided new insights contrary to our previous findings. We found that an increase in fathers' retirement age positively impact their adult children's life satisfaction and income satisfaction, particularly adult sons. In contrast, we did not observe any significant effect of an increase in mothers' retirement age on the well-being dimensions of adult children. Our DiD evidence highlights the importance of inter-generational financial transfers from fathers to adult children having low-income levels. Our paper demonstrates that public policies can have multigenerational spillover effects with significant distributional consequences. Our findings underscore the importance of intergenerational transfers and the need for policymakers to consider these dynamics when designing retirement policies.

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# A Attrition

Figures 5 and Figure 6 illustrate the BHPS and UKHLS sample composition as a function of the respondent's first wave in each interview year. In wave 9 of BHPS ('99-2000), households from Scotland and Wales entered the survey, and wave 11 ('01-02) counted new households from Northern Ireland.

The degree of attrition from the BHPS survey is not negligible: of the initial sample of children (in wave 1), 36% participated for 18 years, while only 6% remained in the sample

for 28 years. The degree of attrition from the UKHLS survey is also high: of the initial sample of adult children, 33% are still participating after 12 years.

FIGURE 5: BHPS waves composition

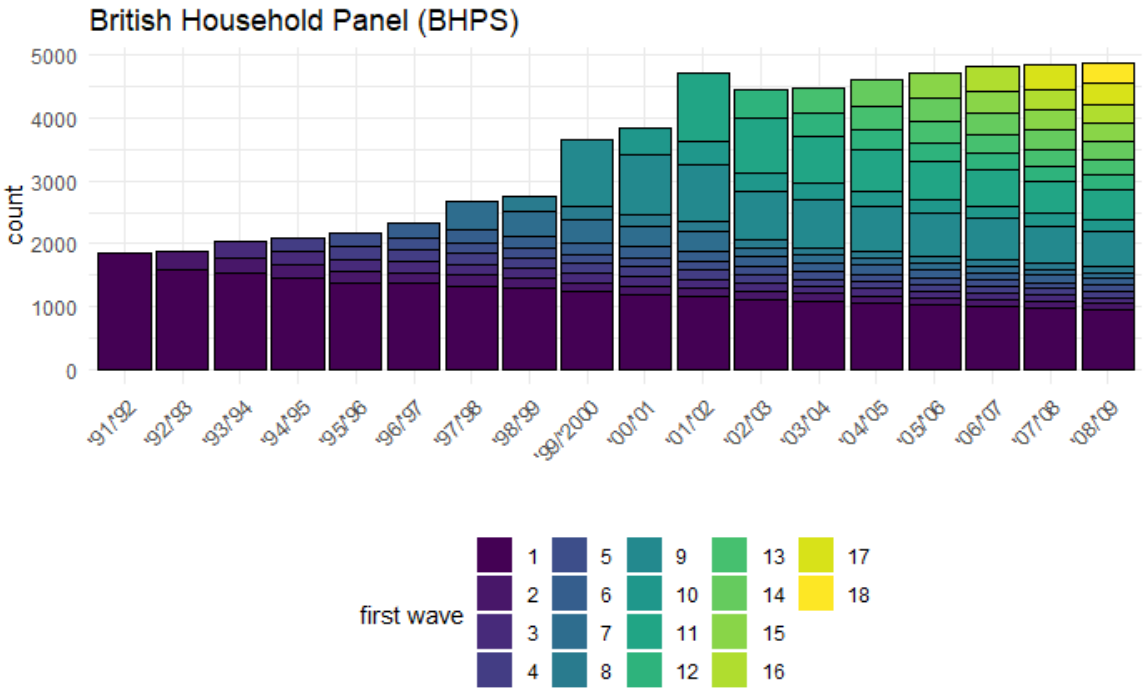
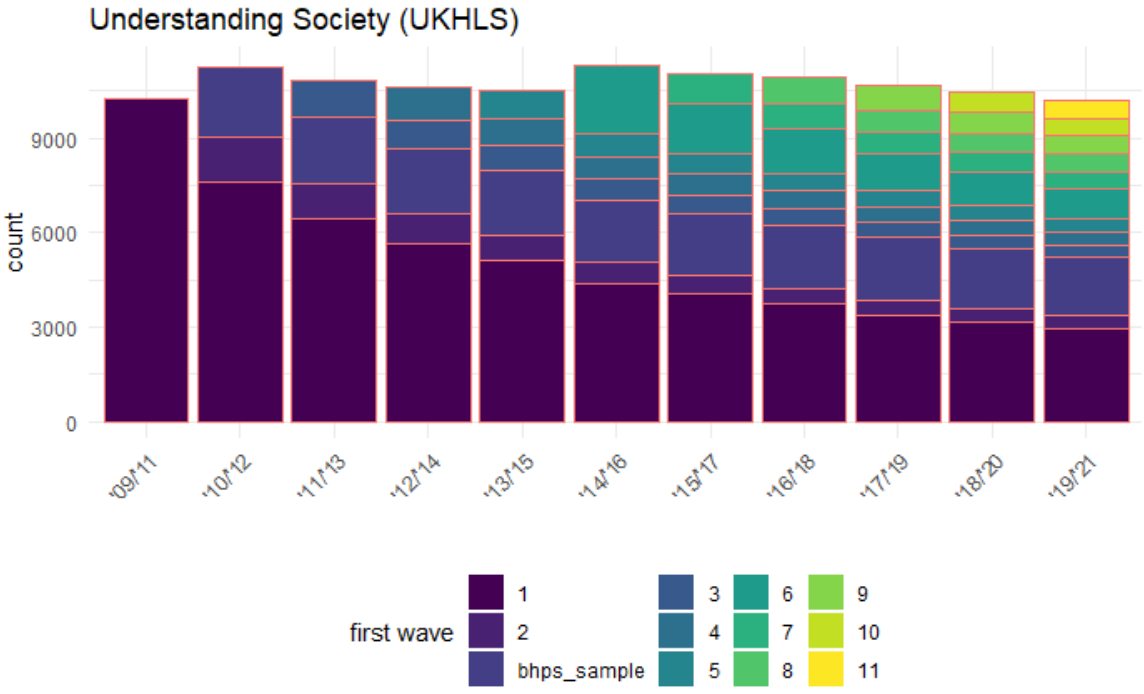



FIGURE 6: UKHLS waves composition




The degree of attrition from the BHPS survey is not negligible: of the initial sample of

children (in wave 1), 36% participated for 18 years, while only 6% remained in the sample for 28 years. The degree of attrition from the UKHLS survey is also high: of the initial sample of adult children, 33% are still participating after 12 years. We analyze attrition bias in the two samples by estimating the correlation coefficients among socio-demographic variables and a dummy variable for dropout at any waves after the first wave.

In the BHPS sample, the main demographic predictors of dropout are age, being male, being white: younger people, being male, and being white predict a higher probability of dropping out from the initial sample. In the UKHLS sample, the same predictors are statistically significant but being white decreases the probability of dropout. Moreover, we notice that in the BHPS sample, having a retired mother decreases the chance of dropping out, while in the UKHLS, this is true for retired fathers and mothers.

In both samples, higher leisure satisfaction predicts a higher dropout chance. In the UKHLS sample, the same occurs for overall life satisfaction. In UKHLS, higher income satisfaction predicts less chance of dropping out.

# B Assumptions

FIGURE 7: Density plots of the running variable. Notes: The plots show the estimated probability density function of the running variable. The plot uses parental age (in months) as the running variable and assumes a threshold at age 720 for mothers and 780 for fathers. The density functions were estimated using the rddensity package in R, using a local quadratic polynomial for the estimation, a cubic polynomial for the bias correction, a triangular kernel, and jackknife standard errors.

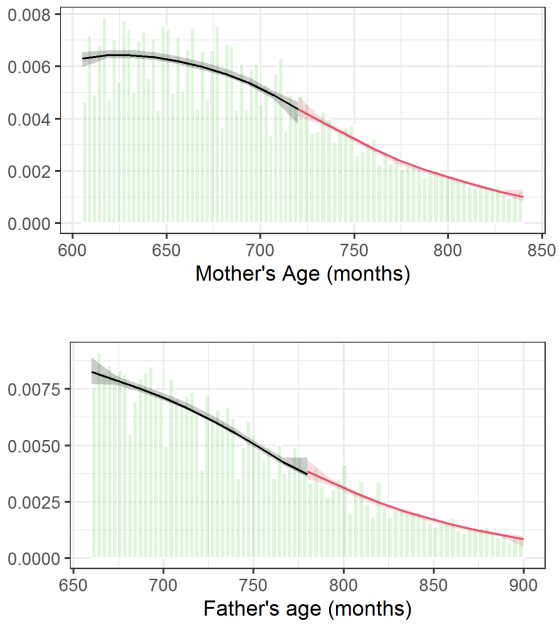



FIGURE 8: Tests for the continuity of the adult child's predetermined variables around the mother SPA. BHPS, own calculations. The dots show averages by parental age in years. The lines show a quadratic fit, and the shaded areas show the 95 percent confidence interval.

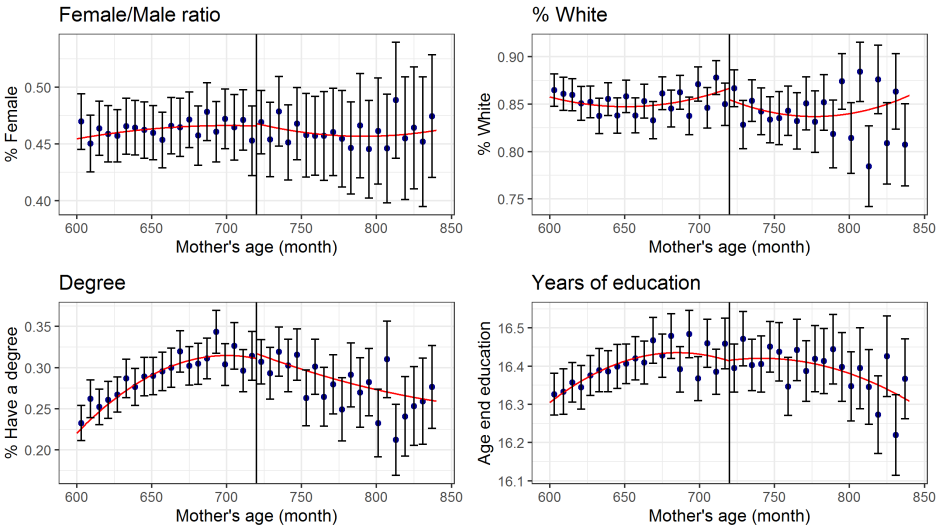


FIGURE 9: Tests for the continuity of the adult child's predetermined variables across the father SPA. BHPS, own calculations. *Note*: see Figure 8.

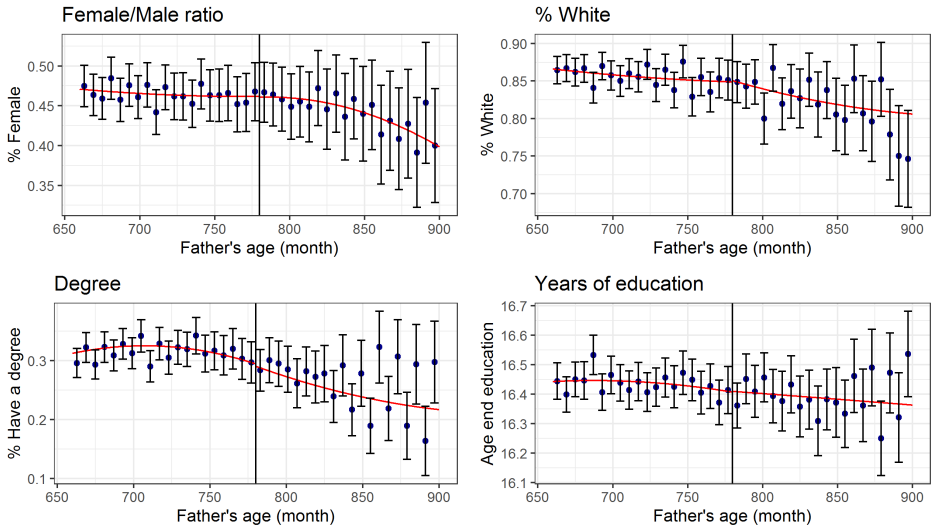
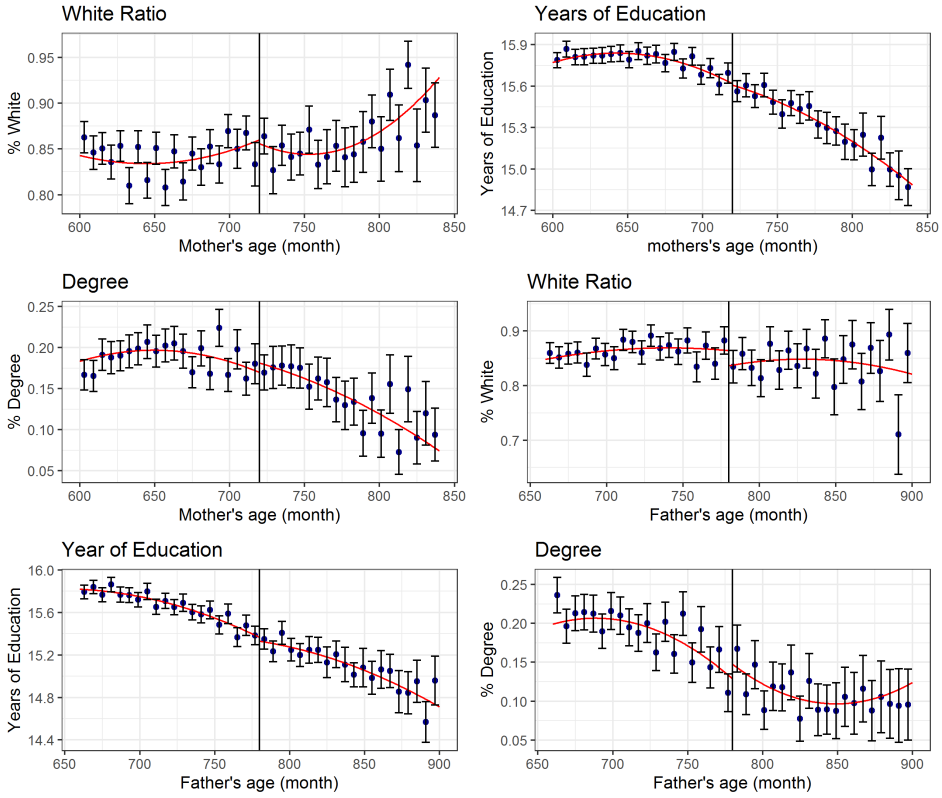



FIGURE 10: Tests for the continuity of the parents predetermined variables across the parents SPA threshold. BHPS, own calculations. *Note*: see Figure 8.




## *B.1 Sensitivity Analysis*

The RDD results may be sensitive to the retirement definition used. Indeed, in the main analysis, we defined parents as retired if they self-report being retired. However, the liter-

ature presents other definitions of retirement that may still be valid. This section assesses the sensitivity of our results to the retirement definition.

We analyse two plausible variants. The first variant considers parents as retired if they self-declared retired or report being inactive and not looking for a job in the month before the interview date. The second variant considers parents as retired only if they receive a pension. Figure 11 illustrates the switching probability according to the three definitions, for mother only.

FIGURE 11: BHPS own elaboration. Mothers switching to retirement according to the three definitions of retirement. *Note*: def1 refers to the definition used in the main analysis, def2 refers to the first variant, def3 refers to the second variant

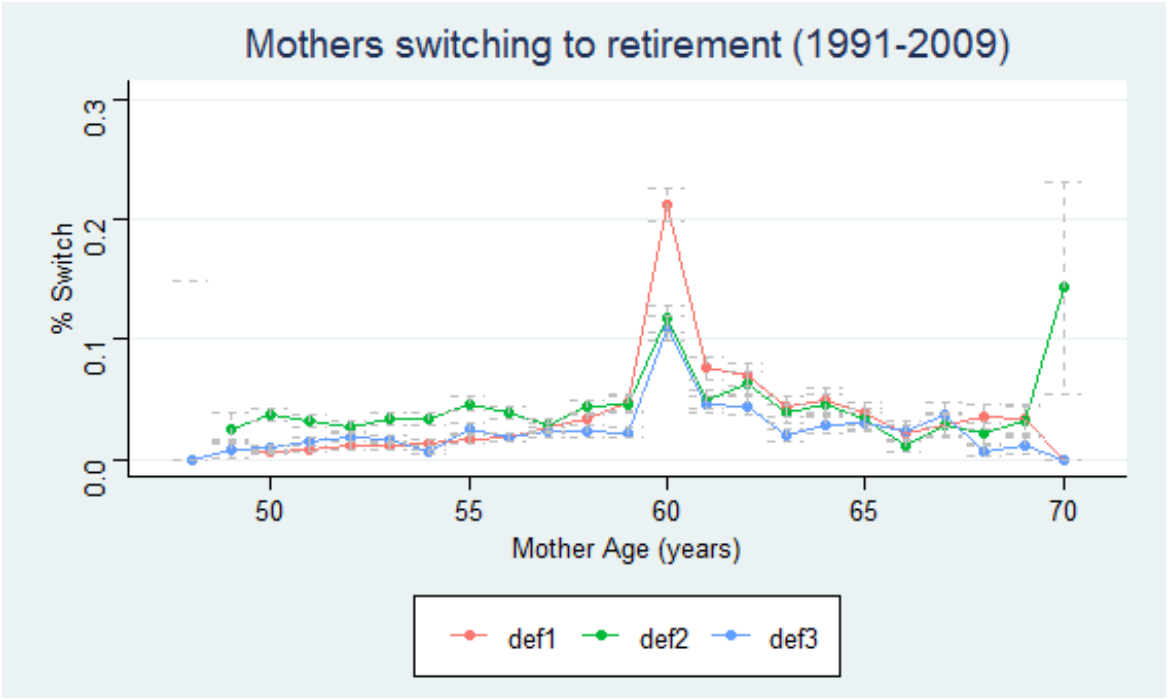


TABLE 12: Mother retirement and adult children's well-being- Sensitivity analysis by retirement definition. The models include a quadratic trend for the child and parents' age. All models include adult children fixed effects, and year and month fixed effects. Age bandwidth of ten years. The coefficients are all standardized.

| Dependent Variables: | Life satisfaction | | Income satisfaction | | Leisure satisfaction | | GHQ | |
|---|---|---|---|---|---|---|---|---|
| | First variant | Second variant | First variant | Second variant | First variant | Second variant | First variant | Second variant |
| **Second-stage IV results** | | | | | | | | |
| mother retired | 0.39** | 0.38** | 0.33* | 0.33* | -0.02 | -0.006 | 0.21 | 0.23 |
| | (0.18) | (0.18) | (0.17) | (0.17) | (0.18) | (0.18) | (0.18) | (0.18) |
| Observations | 17,332 | 17,077 | 17,353 | 17,097 | 17,360 | 17,106 | 20,381 | 20,019 |
| $R^2$ | 0.56904 | 0.57469 | 0.56938 | 0.57325 | 0.54683 | 0.54691 | 0.48401 | 0.48663 |
| **First-stage IV results** | | | | | | | | |
| mother above SPA | 0.16*** | 0.17*** | 0.16*** | 0.17*** | 0.16*** | 0.17*** | 0.16*** | 0.16*** |
| | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| Observations | 17,332 | 17,077 | 17,353 | 17,097 | 17,360 | 17,106 | 20,381 | 20,019 |
| $R^2$ | 0.79147 | 0.75172 | 0.79105 | 0.75235 | 0.79110 | 0.75226 | 0.77371 | 0.72188 |
| F-stat | 410.8 | 640.1 | 401.6 | 626.5 | 403.6 | 641.9 | 447.1 | 628.2 |
| **OLS** | | | | | | | | |
| mother retired | -0.02 | -0.01 | 0.02 | 0.04 | 0.002 | -0.05 | 0.003 | 0.005 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) | (0.03) | (0.03) |
| Observations | 17,332 | 17,077 | 17,353 | 17,097 | 17,360 | 17,106 | 20,381 | 20,019 |
| $R^2$ | 0.57683 | 0.57908 | 0.57340 | 0.57548 | 0.54643 | 0.54663 | 0.48653 | 0.48855 |

*Clustered (pidp) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

## *B.2 Robustness checks*

We perform two robustness checks. The first assesses the robustness of the RDD-IV results to change in the age bandwidth around the cutoff, looking at eight, five, and three years. The second enlarges the age bandwidth of adult children from 20-45 to 16-50, holding the parental age at ±10 years before and after the State Pension Age.

TABLE 13: Mother retirement and adult children's outcomes- Robustness checks, age bandwidth. The models include a quadratic trend for the child and parents' age. All models include adult children fixed effects, and year and month fixed effects. Age bandwidth of ten years. The coefficients are all standardized.

| Dependent Variables: | Life Satisfaction | | | | Income Satisfaction | | | | Leisure Satisfaction | | | | GHQ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bandwidht: | 8 years | 5 years | 3 years | 16-50 | 8 years | 5 years | 3 years | 16-50 | 8 years | 5 years | 3 years | 16-50 | 8 years | 5 years | 3 years | 16-50 |
| **Second-stage IV results** | | | | | | | | | | | | | | | | |
| mother retirement | 0.25** | 0.29** | 0.28 | 0.20** | 0.19* | 0.20 | 0.17 | 0.19** | 0.03 | -0.02 | -0.07 | -0.005 | 0.09 | 0.08 | 0.16 | 0.13 |
| | (0.11) | (0.13) | (0.20) | (0.10) | (0.10) | (0.12) | (0.19) | (0.09) | (0.11) | (0.13) | (0.20) | (0.10) | (0.10) | (0.13) | (0.18) | (0.09) |
| Observations | 14,423 | 9,434 | 6,104 | 19,417 | 14,444 | 9,458 | 6,121 | 19,420 | 14,449 | 9,459 | 6,120 | 19,448 | 16,785 | 10,746 | 6,838 | 22,943 |
| $R^2$ | 0.581 | 0.618 | 0.669 | 0.566 | 0.585 | 0.625 | 0.666 | 0.571 | 0.558 | 0.582 | 0.626 | 0.539 | 0.499 | 0.529 | 0.581 | 0.482 |

*Clustered (pidp) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

## *B.3 Placebo regressions*

We perform three placebo regressions to support the credibility of our estimates. Specifically, we estimate our main specification using variables as outcomes that should not be affected by maternal retirement. Specifically, we looked at ($i$) whether the adult children have a university degree, ($ii$) the total number of cited income sources, and ($iii$) the

adult children region where living. Table 14 illustrates the results. Effects sizes are small and not statistically significant.

TABLE 14: Mother retirement and adult children's outcomes- Placebo regressions. The models include a quadratic trend for the child and parents' age. All models include adult children fixed effects, and year and month fixed effects. Age bandwidth of ten years. The coefficients are all standardized.

| Dependent Variables: | Degree | | | Number income sources | | | Subj. health | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample: | All | Daughters | Sons | All | Daughters | Sons | All | Daughters | Sons |
| **Second-stage IV results** | | | | | | | | | |
| mother retirement | -0.02 | -0.04 | 0.005 | 0.02 | -0.003 | 0.05 | -0.01 | -0.10 | 0.07 |
| | (0.02) | (0.02) | (0.02) | (0.10) | (0.18) | (0.11) | (0.08) | (0.12) | (0.10) |
| Observations | 23,037 | 10,928 | 12,109 | 21,262 | 10,306 | 10,956 | 22,245 | 10,631 | 11,614 |
| $R^2$ | 0.92580 | 0.92158 | 0.92971 | 0.70835 | 0.72974 | 0.59814 | 0.54805 | 0.52506 | 0.56944 |
| F-stat | 1,855 | 907.2 | 942.7 | 1,786.2 | 871.5 | 909.0 | 1,820.4 | 888.1 | 924.1 |

# C Descriptive Statistics DiD samples

TABLE 15: Descriptive statistics by treatment cohorts. Mothers sample

| Cohort | Untreated (Before Apr. 1950) | | | | First reform (Apr. 1950 - March 1953) | | | | Second reform (Apr. 1953- Nov. 1953) | | | | Third reform (Dec.1953 - Sept. 1954) | | | | Fourth reform (After Sept. 1954) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Ind | Mean | Sd | N | Ind | Mean | Sd | N | Ind | Mean | Sd | N | Ind | Mean | Sd | N | Ind | Mean | Sd |
| *A. Adult children outcomes* | | | | | | | | | | | | | | | | | | | | |
| GHQ | 23846 | 3087 | 25.1 | 5.4 | 8692 | 1278 | 25.1 | 5.3 | 2023 | 331 | 24.3 | 5.8 | 2676 | 455 | 24.4 | 6.1 | 27960 | 6139 | 24.5 | 5.7 |
| Life satisfaction | 21131 | 2922 | 5.2 | 1.2 | 8530 | 1258 | 5.2 | 1.3 | 2042 | 337 | 5.1 | 1.4 | 2711 | 458 | 5.1 | 1.4 | 28014 | 6123 | 5.1 | 1.4 |
| Income Satisfaction | 21151 | 2918 | 4.5 | 1.5 | 8533 | 1255 | 4.6 | 1.5 | 2039 | 337 | 4.4 | 1.6 | 2709 | 457 | 4.4 | 1.6 | 27992 | 6118 | 4.6 | 1.6 |
| Leisure satisfaction | 21161 | 2922 | 4.4 | 1.5 | 8533 | 1258 | 4.5 | 1.5 | 2043 | 337 | 4.4 | 1.6 | 2711 | 458 | 4.5 | 1.6 | 28016 | 6123 | 4.6 | 1.6 |
| *A. Adult children characteristics* | | | | | | | | | | | | | | | | | | | | |
| Age | 29450 | 3898 | 31.2 | 6.3 | 11359 | 1702 | 30.7 | 6.2 | 2626 | 418 | 30.0 | 6.2 | 3811 | 631 | 29.1 | 5.9 | 40477 | 8390 | 27.0 | 5.1 |
| Married | 29380 | 3896 | 0.4 | 0.5 | 11334 | 1701 | 0.3 | 0.4 | 2618 | 417 | 0.3 | 0.5 | 3799 | 631 | 0.3 | 0.4 | 40211 | 8376 | 0.2 | 0.4 |
| School leaving age | 19871 | 2994 | 16.5 | 1.0 | 6310 | 1165 | 16.6 | 1.0 | 1624 | 305 | 16.7 | 1.0 | 2200 | 422 | 16.5 | 1.1 | 23904 | 4934 | 16.6 | 1.1 |
| Female | 29449 | 3897 | 0.5 | 0.5 | 11359 | 1702 | 0.5 | 0.5 | 2626 | 418 | 0.4 | 0.5 | 3811 | 631 | 0.5 | 0.5 | 40472 | 8386 | 0.5 | 0.5 |
| Active in labour market | 26434 | 3376 | 0.9 | 0.3 | 9915 | 1423 | 0.9 | 0.3 | 2317 | 372 | 0.8 | 0.4 | 3152 | 515 | 0.8 | 0.4 | 33275 | 6937 | 0.8 | 0.4 |
| Number of child | 29450 | 3898 | 0.6 | 0.9 | 11359 | 1702 | 0.6 | 0.9 | 2626 | 418 | 0.6 | 0.9 | 3811 | 631 | 0.5 | 1.0 | 40476 | 8390 | 0.4 | 0.8 |
| Full time job | 21180 | 2950 | 0.8 | 0.4 | 7491 | 1204 | 0.8 | 0.4 | 1718 | 303 | 0.8 | 0.4 | 2292 | 423 | 0.8 | 0.4 | 22525 | 5415 | 0.8 | 0.4 |
| Weekly hours work | 26111 | 3382 | 32.5 | 18.7 | 9701 | 1418 | 31.2 | 18.8 | 2271 | 373 | 30.4 | 19.3 | 3111 | 516 | 29.9 | 19.2 | 33018 | 7034 | 28.0 | 19.9 |
| Individual income (gross) | 25060 | 3251 | 1581.9 | 1533.3 | 9532 | 1397 | 1781.3 | 1798.6 | 2239 | 367 | 1800.9 | 1620.4 | 3022 | 505 | 1805.6 | 6482.9 | 32072 | 6919 | 1616.4 | 3598.2 |
| Live with mother | 29450 | 3898 | 0.3 | 0.5 | 11359 | 1702 | 0.4 | 0.5 | 2626 | 418 | 0.4 | 0.5 | 3811 | 631 | 0.5 | 0.5 | 40477 | 8390 | 0.5 | 0.5 |
| White | 28709 | 3736 | 0.8 | 0.4 | 11208 | 1663 | 0.7 | 0.5 | 2608 | 414 | 0.7 | 0.6 | 3782 | 623 | 0.8 | 0.7 | 40368 | 8367 | 0.8 | 0.6 |
| distance (KM) | 21300 | 3458 | 19.1 | 58.4 | 8382 | 1519 | 20.3 | 63.5 | 1870 | 367 | 13.4 | 48.1 | 2890 | 562 | 10.4 | 41.0 | 31640 | 7405 | 14.5 | 57.7 |
| *B. Mother characteristics* | | | | | | | | | | | | | | | | | | | | |
| GHQ | 21690 | 1563 | 24.5 | 5.4 | 8341 | 642 | 24.3 | 5.4 | 1855 | 160 | 23.8 | 5.4 | 2657 | 245 | 23.9 | 5.8 | 30691 | 3378 | 23.8 | 5.9 |
| Retired | 23615 | 1645 | 0.4 | 0.5 | 9170 | 677 | 0.3 | 0.5 | 2045 | 168 | 0.3 | 0.4 | 3032 | 262 | 0.2 | 0.4 | 33819 | 3551 | 0.1 | 0.3 |
| Above SPA | 29450 | 1838 | 0.5 | 0.5 | 11359 | 773 | 0.4 | 0.5 | 2626 | 189 | 0.2 | 0.4 | 3811 | 292 | 0.1 | 0.2 | 40477 | 3979 | 0.0 | 0.0 |
| Age | 28133 | 1838 | 59.7 | 5.4 | 10653 | 773 | 59.0 | 5.4 | 2482 | 189 | 58.9 | 4.9 | 3610 | 291 | 58.2 | 4.5 | 39159 | 3925 | 55.4 | 3.6 |
| Number of child | 29450 | 1838 | 2.5 | 1.3 | 11359 | 773 | 2.6 | 1.4 | 2626 | 189 | 2.5 | 1.2 | 3811 | 292 | 2.6 | 1.7 | 40477 | 3979 | 2.5 | 1.4 |
| School leaving age | 22374 | 1610 | 15.7 | 1.3 | 6961 | 651 | 16.1 | 1.3 | 1661 | 156 | 16.3 | 1.3 | 2344 | 256 | 16.3 | 1.2 | 25853 | 2916 | 16.4 | 1.2 |
| Full time job | 10379 | 997 | 0.5 | 0.5 | 4843 | 489 | 0.5 | 0.5 | 915 | 123 | 0.6 | 0.5 | 1769 | 209 | 0.6 | 0.5 | 23333 | 2898 | 0.6 | 0.5 |
| Weekly hours work | 23300 | 1657 | 12.1 | 16.0 | 9028 | 675 | 15.3 | 16.4 | 2024 | 168 | 13.1 | 16.0 | 2965 | 264 | 17.2 | 16.2 | 32719 | 3544 | 21.3 | 16.2 |
| Individual Income (gross) | 22679 | 1621 | 849.2 | 961.7 | 8871 | 666 | 1270.3 | 1246.9 | 1978 | 164 | 1244.0 | 1350.9 | 2932 | 258 | 1437.0 | 1993.6 | 33023 | 3537 | 1588.7 | 2770.9 |

TABLE 16: Descriptive statistics by treatment cohorts. Fathers sample

| Cohort | Untreated (Before Dec. 1953) | | | | First reform (After Nov. 1953) | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Ind | Mean | Sd or Perc | N | Ind | Mean | Sd or Perc |
| *A. Adult children outcomes* | | | | | | | | |
| GHQ | 29971 | 4307 | 25.1 | 5.4 | 15607 | 4207 | 24.3 | 5.8 |
| Life satisfaction | 29310 | 4297 | 5.2 | 1.3 | 15631 | 4197 | 5.2 | 1.4 |
| Income satisfaction | 29324 | 4293 | 4.6 | 1.5 | 15618 | 4194 | 4.7 | 1.6 |
| Leisure Satisfaction | 29336 | 4299 | 4.5 | 1.5 | 15631 | 4197 | 4.6 | 1.5 |
| *A. Adult children characteristics* | | | | | | | | |
| Age | 38799 | 5658 | 31.2 | 6.4 | 22228 | 5670 | 27.3 | 5.1 |
| Year of birth | 38799 | 5658 | 31.2 | 6.4 | 22228 | 5670 | 27.3 | 5.1 |
| Married | 38696 | 5655 | 0.4 | 0.5 | 22061 | 5646 | 0.2 | 0.4 |
| School leaving Age | 21950 | 3926 | 16.6 | 1.0 | 12517 | 2996 | 16.6 | 1.0 |
| Female | 38799 | 5658 | 0.5 | 0.5 | 22225 | 5668 | 0.5 | 0.5 |
| Active in labour market | 34023 | 4787 | 0.9 | 0.3 | 18030 | 4620 | 0.8 | 0.4 |
| Number of children | 38799 | 5658 | 0.7 | 1.0 | 22228 | 5670 | 0.4 | 0.8 |
| Full time job | 26416 | 4041 | 0.8 | 0.4 | 12433 | 3629 | 0.8 | 0.4 |
| Weekly hours work | 33562 | 4802 | 31.7 | 18.6 | 17980 | 4739 | 27.8 | 20.0 |
| income | 32673 | 4688 | 1821.5 | 2567.8 | 17383 | 4622 | 1728.3 | 4664.5 |
| Live with father | 38799 | 5658 | 0.3 | 0.5 | 22228 | 5670 | 0.5 | 0.5 |
| White | 38107 | 5506 | 0.7 | 0.5 | 22228 | 5670 | 0.8 | 0.6 |
| Distance (KM) | 26035 | 4612 | 19.8 | 60.4 | 16536 | 4629 | 16.4 | 59.6 |
| *B. Father characteristic* | | | | | | | | |
| GHQ | 23667 | 1879 | 26.0 | 4.5 | 14057 | 1937 | 25.3 | 5.3 |
| retired | 27413 | 2088 | 0.4 | 0.5 | 16001 | 2120 | 0.1 | 0.3 |
| Above SPA | 38799 | 2599 | 0.4 | 0.5 | 22228 | 2781 | 0.0 | 0.1 |
| Age | 35530 | 2591 | 62.9 | 5.1 | 20852 | 2629 | 58.4 | 2.8 |
| Number of adult children | 38799 | 2599 | 2.6 | 1.4 | 22228 | 2781 | 2.5 | 1.3 |
| School leaving Age | 23700 | 2138 | 15.9 | 1.4 | 13956 | 1830 | 16.5 | 1.3 |
| Full time job | 13487 | 1443 | 0.8 | 0.4 | 10904 | 1714 | 0.9 | 0.3 |
| Weekly hours work | 27284 | 2148 | 19.5 | 21.6 | 15430 | 2105 | 28.4 | 19.1 |
| Individual Income (gross) | 26055 | 2039 | 2019.2 | 3151.0 | 15602 | 2117 | 2853.8 | 6024.7 |